Pink Hibiscus Mealybug (PHM)-Survey Information

Maconellicoccus hirsutus (Green)

Credits: Karolynne Griffiths, Paul Hornby, Dr. Lance Osborne, Dr. Amy Roda, Frank Burgos, Dr. David Dean, Andrea Chavez, and Dr. Dale Meyerdirk.

PHM Cooperative Program

- United States Department of Agriculture – Animal Plant Health Inspection Service & Agricultural Research Service
- Land Grant Universities
- State Department of Agriculture
- Puerto Rico Department of Agriculture

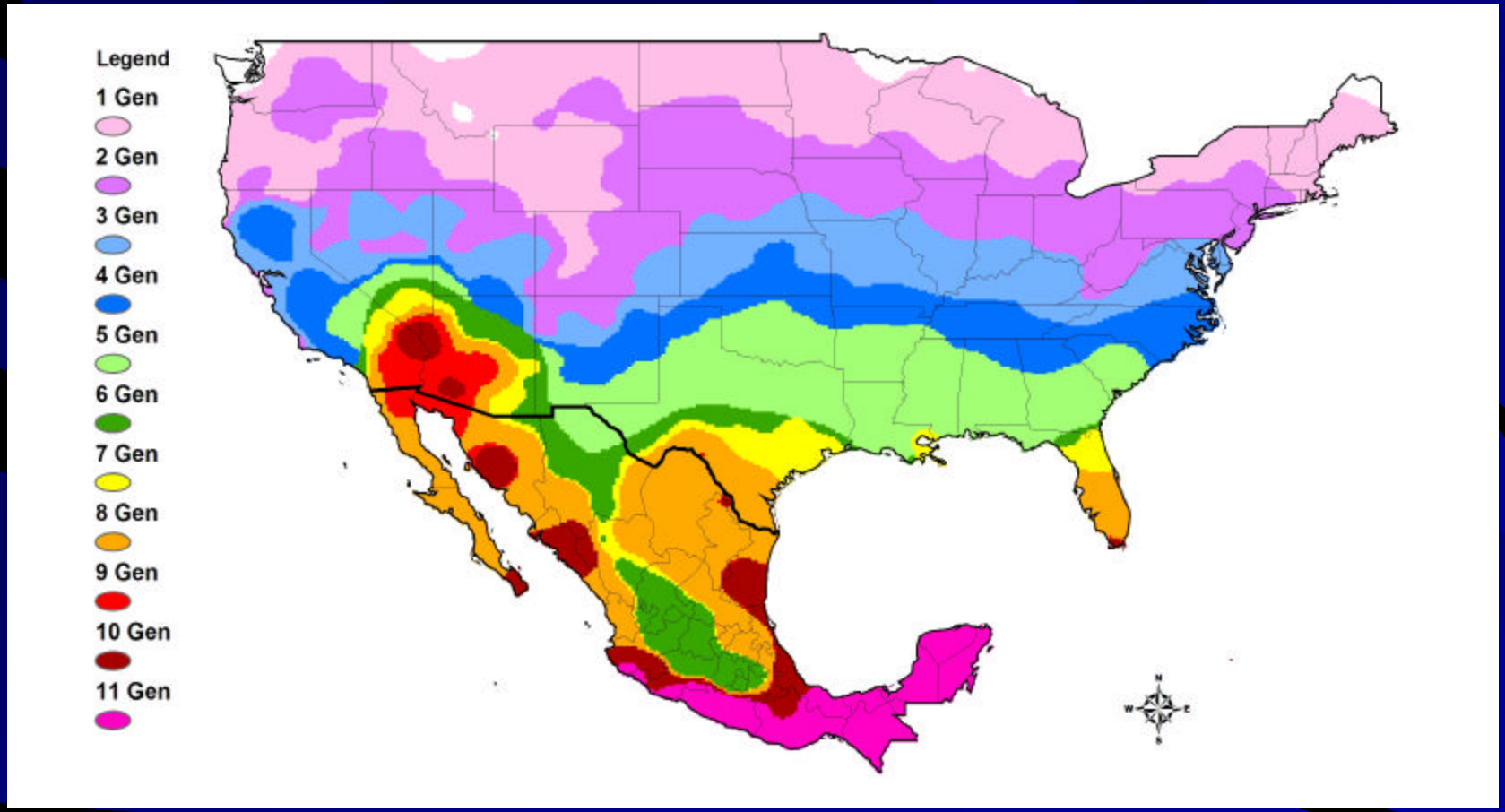
PHM

- Serious threat to over 250 species of agricultural, ornamental, and horticultural plants.
- Commonly found in tropical Africa, India, Egypt, northern Australia, and SE Asia.

Spread of Pink Hibiscus Mealybug Throughout Western Hemisphere

- 1984 - Hawaii
- 1994 - Grenada, Carriacou
- 1995 – Trinidad, St. Kitts and Nevis
- 1996 –Tobago, Aruba, St. Maarten, St. Lucia
- 1997 – St. Eustatius, Curacao, Anguilla, Guyana, British Virgin Islands, St. Vincent, Grenadines, St. Thomas, St. Croix, St. John, Culebra, Vieques
- 1998 – Montserrat, Guadeloupe, Puerto Rico
- 1999 – Martinique, USA (California), Belize, Mexico, Venezuela ?
- 2000 – Barbados, Bahamas
- 2001 – Antigua, Dominica, Suriname
- 2002 – Florida (USA), Haiti, Dominican Republic

PHM Potential Distribution



Potential number of pink hibiscus mealybug, *Maconellicoccus hirsutus*, generations in U.S. and Mexico, based on the requirement of 300 degree days per generation and a base developmental temperature of 17.5° C.

PHM Survey


PHM Egg Masses


Leaf Distortion


Malformed Flowers
"Bunchy Top"

Pink Hibiscus Mealybug Host Plants

Fruits

- Papaya
- Sugar-apple
- Golden apple
- Pigeon pea
- Carambola
- Soursop
- Cherry
- Passion fruit
- Avocado
- Mango
- Plum
- Grape
- Citrus
- Breadfruit
- Guava
- Banana

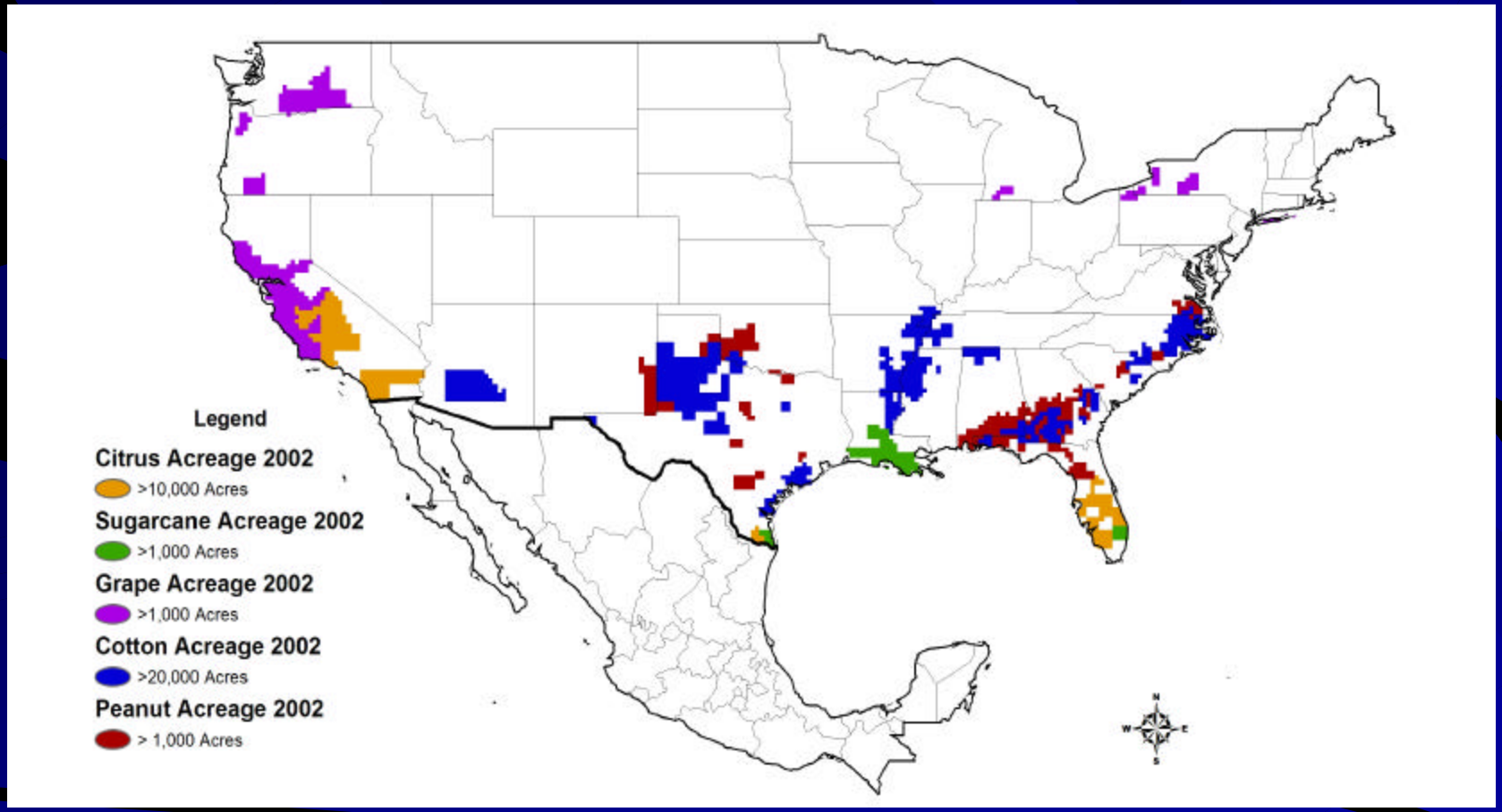
Ornamental

- Hibiscus
- Croton
- Allamanda
- Anthurium
- Heliconia
- Lantana
- Seagrape
- Bougainvillea
- Oleander
- Ixora
- Ginger lily
- Schefflera
- Ficus

Vegetable

- Tomato
- Pumpkin
- Okra
- Lettuce
- Beans
- Cucumber
- Peppers
- Dasheen
- Cabbage
- Squash

U.S. Crop Distribution Map



Five agricultural commodity hosts of pink hibiscus mealybug, *Maconellicoccus hirsutus*, based on county level data from National Agricultural Statistics Service data 2002.

PHM Survey Guidelines

- Teams are comprised of two survey personnel.
- Each survey team is provided with section maps (one square mile per map) to plot 8 – 10 survey sites within each section or grid.
- Survey teams should always attempt to contact the property owner prior to conducting any inspections. A brief explanation of the survey should be provided along with relevant PHM program handouts. If the property owner is not present, a PHM door hanger should be posted upon completing the survey.
- Every attempt should be made to inspect target host plants located in the front of the properties. Do not access the back of a property without permission.

PHM Survey Guidelines

- Each inspection will be documented on a survey form. Information includes; Section Township Range (STR) or grid number, address, host, sample collected / not collected. Survey records will be submitted to the survey coordinator at the end of each day.

- Suspect PHM samples should include at least a 3 inch cutting of infested plant material. Samples should be double bagged with a paper towel inserted to absorb excess moisture. When a sample is collected a property map must be drawn indicating the location of the suspect host plant(s) for the purpose of expediting parasite release activities.

- Suspect samples must be submitted for identification at the end of each day.

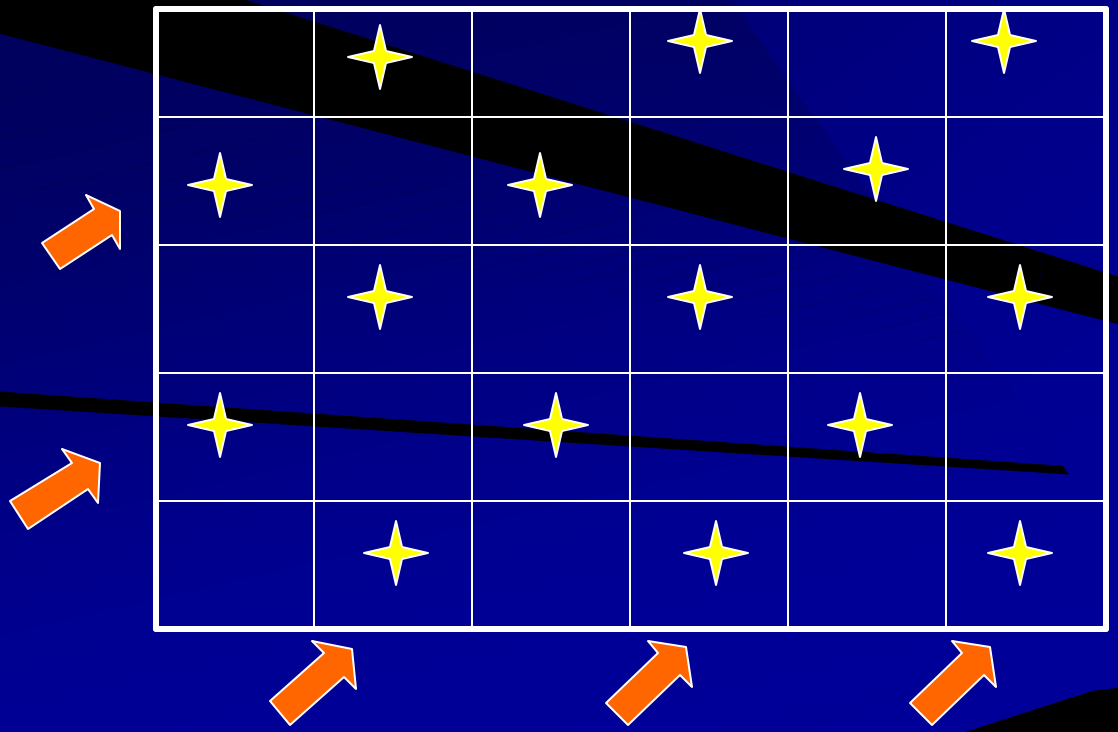
Alternate Host Plants

Florida Trema (*Trema micranthum*)

Photo credit: Paul Hornby

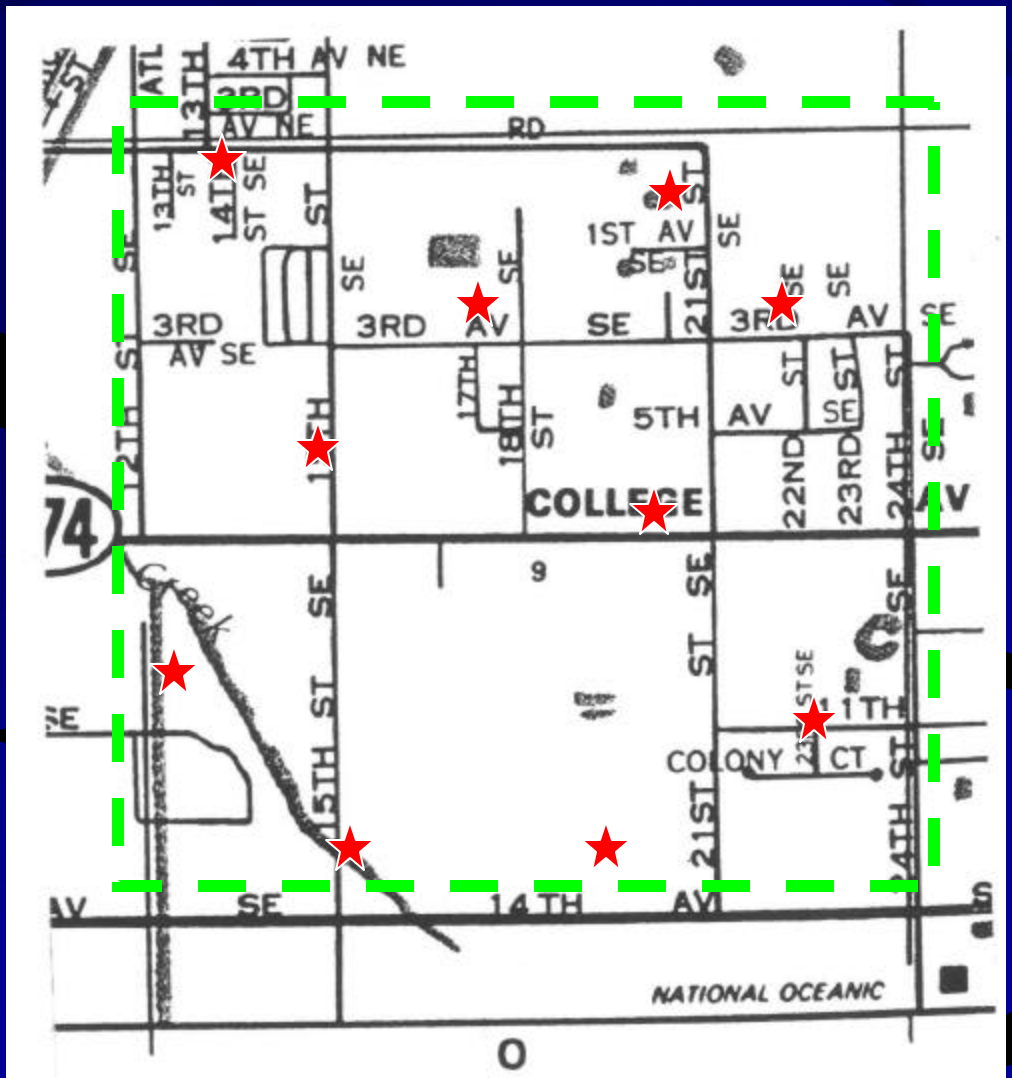
PHM Survey Guidelines

- Target goals – 8 to 10 sites evenly distributed within a section or square mile utilizing hibiscus or other indicator plants.
- Strategy involves surveying a diagonal line of sections (transect) out from core area skipping every other transect.

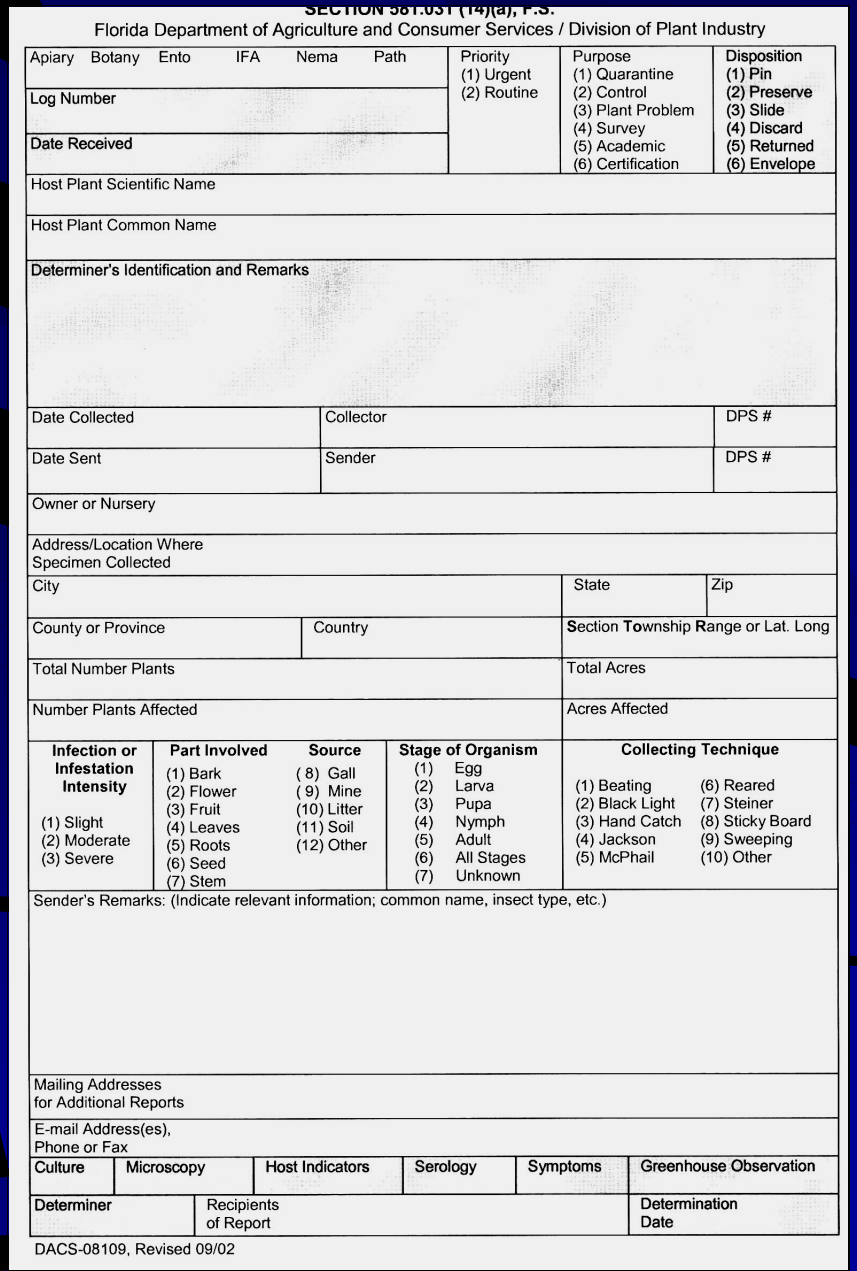


PHM Survey Guidelines

- Each survey team is provided with section maps to plot the 8 – 10 survey sites within each section. Utilizing these maps ensures that there is an even distribution of survey sites throughout the section.



PHM Survey Guidelines



SECTION 581.031 (14)(a), F.S.

Florida Department of Agriculture and Consumer Services / Division of Plant Industry

Apiary Botany Ento IFA Nema Path	Priority (1) Urgent (2) Routine	Purpose (1) Quarantine (2) Control (3) Plant Problem (4) Survey (5) Academic (6) Certification	Disposition (1) Pin (2) Preserve (3) Slide (4) Discard (5) Returned (6) Envelope
Log Number			
Date Received			

Host Plant Scientific Name

Host Plant Common Name

Determiner's Identification and Remarks

Date Collected	Collector	DPS #
Date Sent	Sender	DPS #

Owner or Nursery

Address/Location Where Specimen Collected

City	State	Zip

County or Province	Country	Section Township Range or Lat. Long

Total Number Plants	Total Acres
Number Plants Affected	Acres Affected

Infection or Infestation Intensity	Part Involved	Source	Stage of Organism	Collecting Technique	
(1) Slight	(1) Bark	(8) Gall	(1) Egg	(1) Beating	(6) Reared
(2) Moderate	(2) Flower	(9) Mine	(2) Larva	(2) Black Light	(7) Steiner
(3) Severe	(3) Fruit	(10) Litter	(3) Pupa	(3) Hand Catch	(8) Sticky Board
	(4) Leaves	(11) Soil	(4) Nymph	(4) Jackson	(9) Sweeping
	(5) Roots	(12) Other	(5) Adult	(5) McPhail	(10) Other
	(6) Seed		(6) All Stages		
	(7) Stem		(7) Unknown		

Sender's Remarks: (Indicate relevant information; common name, insect type, etc.)

Mailing Addresses for Additional Reports

E-mail Address(es), Phone or Fax

Culture	Microscopy	Host Indicators	Serology	Symptoms	Greenhouse Observation

Determiner	Recipients of Report	Determination Date

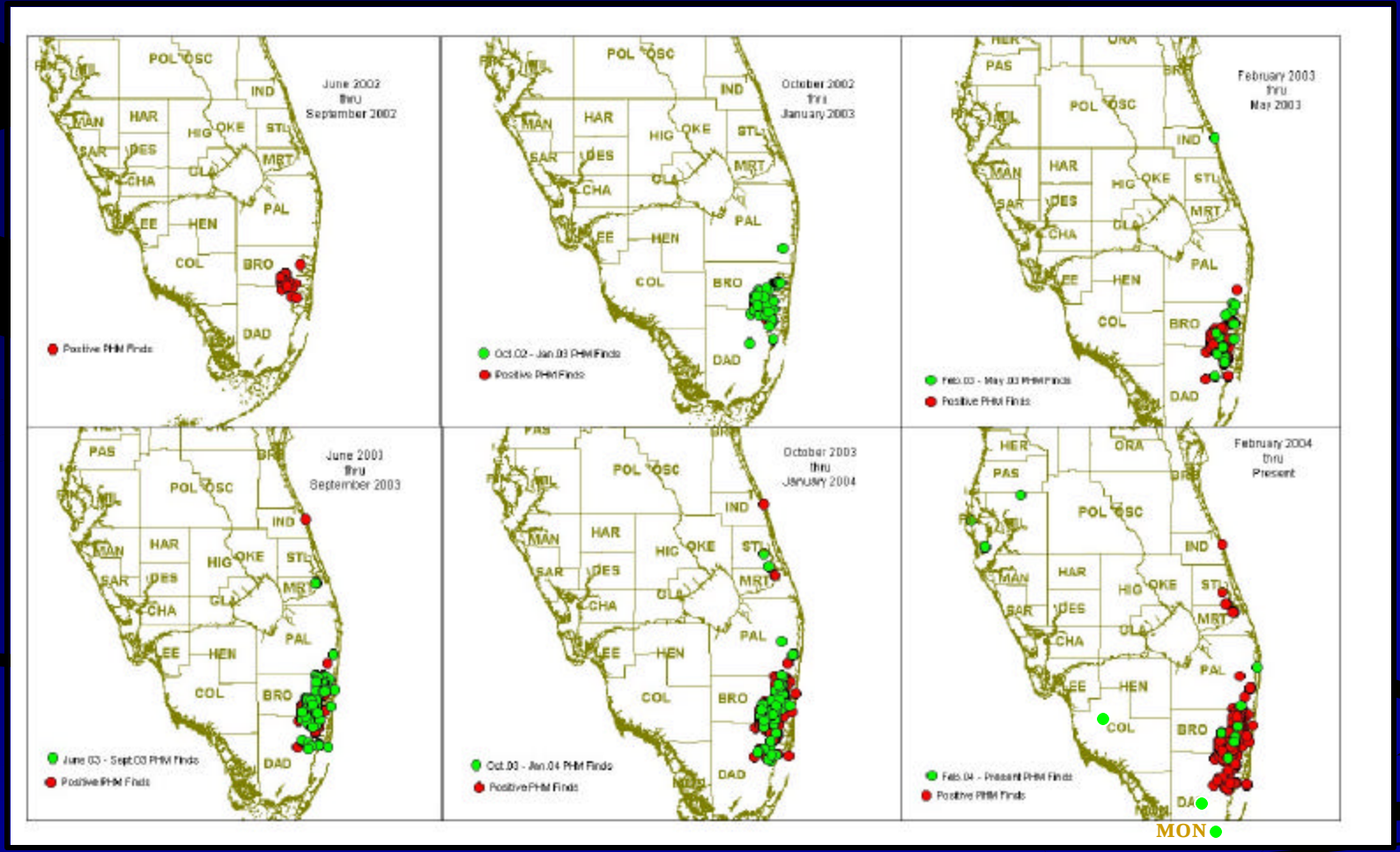
DACS-08109, Revised 09/02

A specimen report must be included with each sample. The report must include details such as the date, host, address, STR or grid number, level of infestation, number of plants involved, collector, etc.

PHM Survey Guidelines

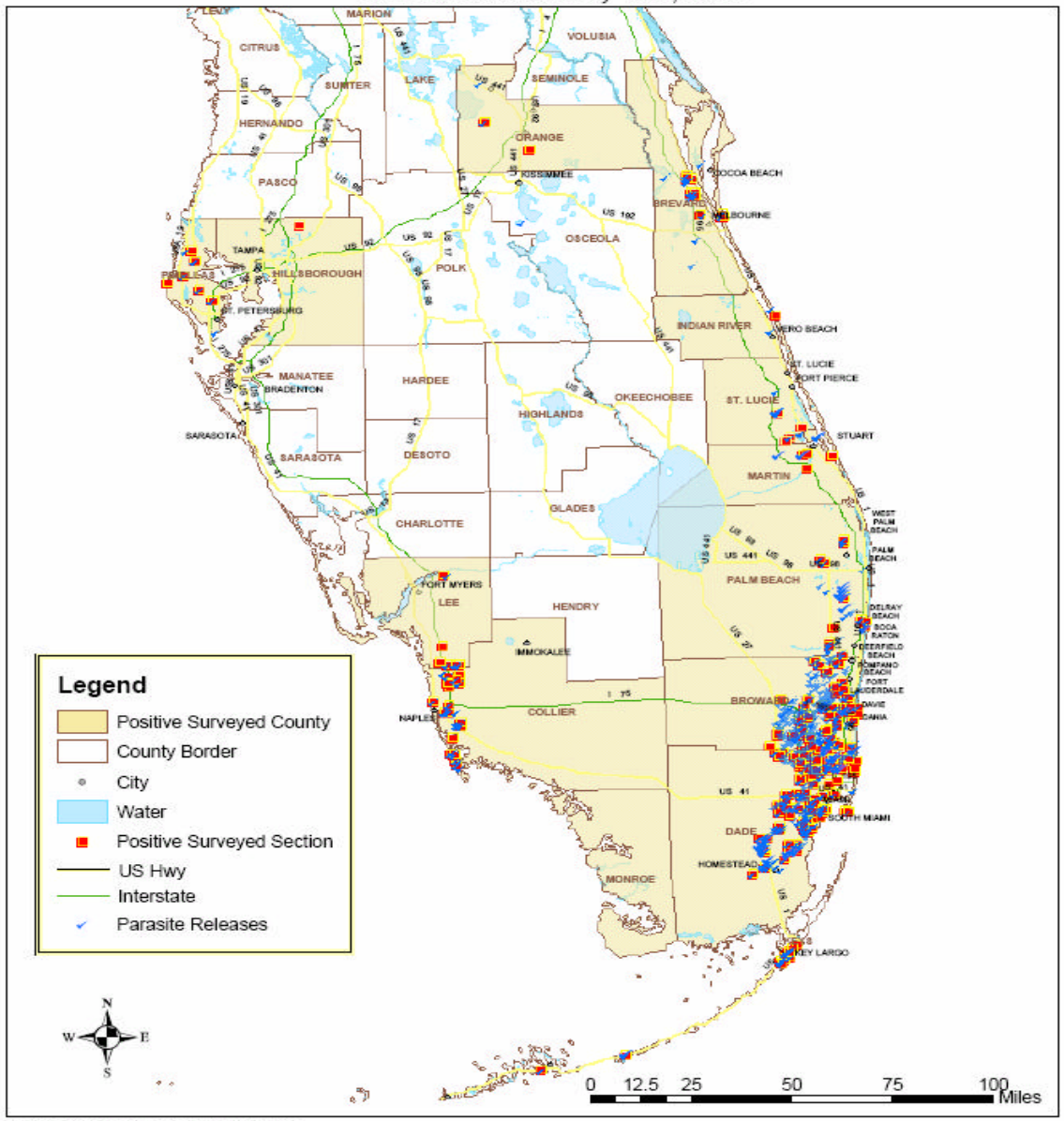
- Designation of personnel to obtain necessary survey equipment and supplies prior to initiating survey activities.
- Designation of personnel for data management and mapping at the onset of the program.
- All records relating to the survey should be maintained in respective STR or grid folders and reviewed by the survey coordinator on a daily basis.
- A wall map of the survey area will be updated on a daily basis. Updates include areas surveyed and the PHM status of each section (positive and negative).

PHM Quarterly Progression



Pink Hibiscus Mealybug Survey

PHM Status as of May 12th, 2005



Created by CAPS-FDACS - Andrea Chavez - 12 May 2005
GCS NAD 1983 HARN

Quarantine Strategies

In an effort to limit the distribution of this prolific pest, quarantine actions must be developed. The following two options are the Florida Department of Agriculture and Consumer Services (FDACS) Division of Plant Industry (DPI) requirements for controlling PHM in infested nurseries and stock dealer establishments:

1. Destruction of PHM infested nursery stock under the supervision of a DPI representative, followed by treatment of all remaining plants with a University of Florida-Institute of Food and Agricultural Sciences (IFAS) recommended pesticide labeled for control of mealybugs.
(See PHM control PDF file)

OR

2. Chemical treatment of all plants (infested and non-infested) until all plants are free of the PHM.

Following a negative inspection for PHM by representatives of the Division of Plant Industry, the nursery or stock dealer establishment will be released from quarantine and placed on a 60 day inspection cycle.

PHM Quarantine Control Actions

← Destruction of infested nursery stock

Followed by → chemical control of remaining exposed plant material

FDACS/DPI Quarantine Control Requirements

PINK HIBISCUS MEALY BUG
CONTROL STRATEGIES CURRENT
CHEMICAL CONTROL
RECOMMENDATIONS
January 11, 2005

The following list of recommendations by the Florida Cooperative Extension Service comprises products that may be effective in treating Pink Hibiscus Mealybug *(Maconellicoccus hirsutis)* in nurseries or stock dealers. Additional materials will be added as available. For additional product information, label rates or guidelines for application, contact the local cooperative extension office listed below.

For Quarantine Treatments:

Chemical	Application	Rate	Interval	Comments
Imidacloprid (such as Marathon) Dinotefuran (such as Safari) Thiamethoxam (such as Flagship)	Soil Drench	See Label Rates	Initial Treatment	Soil drench must be followed by a foliar application of either Bifenthrin, Chlorpyrifos or Acephate
Bifenthrin (such as Talstar)	Foliar Application	See Label Rates	Following Imidacloprid treatment	Apply with organosilicate surfactant such as CapSil, Silwet or Sylgard. Follow up treatments as needed.
Chlorpyrifos (such as DuraGuard ME)	Foliar Application	See Label Rates	Following Imidacloprid treatment	Follow up treatments as needed.
Acephate (such as Acephate, Orthene)	Foliar Application	See Label Rates	Following Imidacloprid treatment	May be applied in conjunction with bifenthrin unless phytotoxicity prohibits.

For Preventative/Prophylactic Treatments:

Chemical	Application	Rate	Interval	Comments
Acetamiprid (such as Tristar)	Foliar Application	See Label Rates	As needed	Apply with organosilicate surfactant such as CapSil, Silwet or Sylgard. Follow up treatments as needed.
Chlorpyrifos (such as DuraGuard ME)	Foliar Application	See Label Rates	As needed	Follow up treatments as needed.
Acephate (such as Acephate, Orthene)	Foliar Application	See Label Rates	As needed	Follow up treatments as needed.
Bifenthrin (such as Talstar)	Foliar Application	See Label Rates	As needed	Apply with organosilicate surfactant such as CapSil, Silwet or Sylgard. Follow up treatments as needed.
Buprofezin (such as Talus)	Foliar Application	See Label Rates	As needed	Follow up treatments as needed.
Pyriproxyfen (such as Distance)	Foliar Application	See Label Rates	As needed	Apply with organosilicate surfactant such as CapSil, Silwet or Sylgard. Follow up treatments as needed.
Pesticidal Oils	Foliar Application	See Label Rates	As needed	Follow up treatments as needed.
Insecticidal Soaps	Foliar Application	See Label Rates	As needed	Follow up treatments as needed.
Imidacloprid + Cyfluthrin (such as Discus)	Foliar Application	See Label Rates	As needed	Follow up treatments as needed.

Note: Limited information is available concerning phytotoxicity of these products. Test on a few plants before application or consult the Cooperative Extension Agent. **When using new materials, phytotoxicity trials should always be conducted in your nursery under your specific conditions!** The use of trade names in this publication is solely for the purpose of providing specific information. UF/IFAS does not guarantee or warranty the products named, and references to them in this publication does not signify our approval to the exclusion of other products of suitable composition. All chemicals should be used in accordance with directions on the manufacturer's label. Use pesticides safely. Read and follow directions on the manufacturer's label.

PHM Parasite Release Program

Media Covering Florida's First Parasite Release

PHM Parasite Release Program

- Two species of parasitic wasps are being utilized; *Anagyrus kamali* and *Gyranusoidea indica.*
- Parasitoids are being supplied weekly from Puerto Rico and California. APHIS has funded over $100,000 to the insectaries. The US Forest Service has also contributed funding.
- Parasite releases should occur on a weekly basis or according to national program protocols.
- Establishment of field study sites to monitor and evaluate the development and efficacy of the parasitoid populations.
- Encapsulation of PHM should be conducted from specimens detected in locations outside of known infested areas to determine if parasitoids have migrated to these areas and are already present.

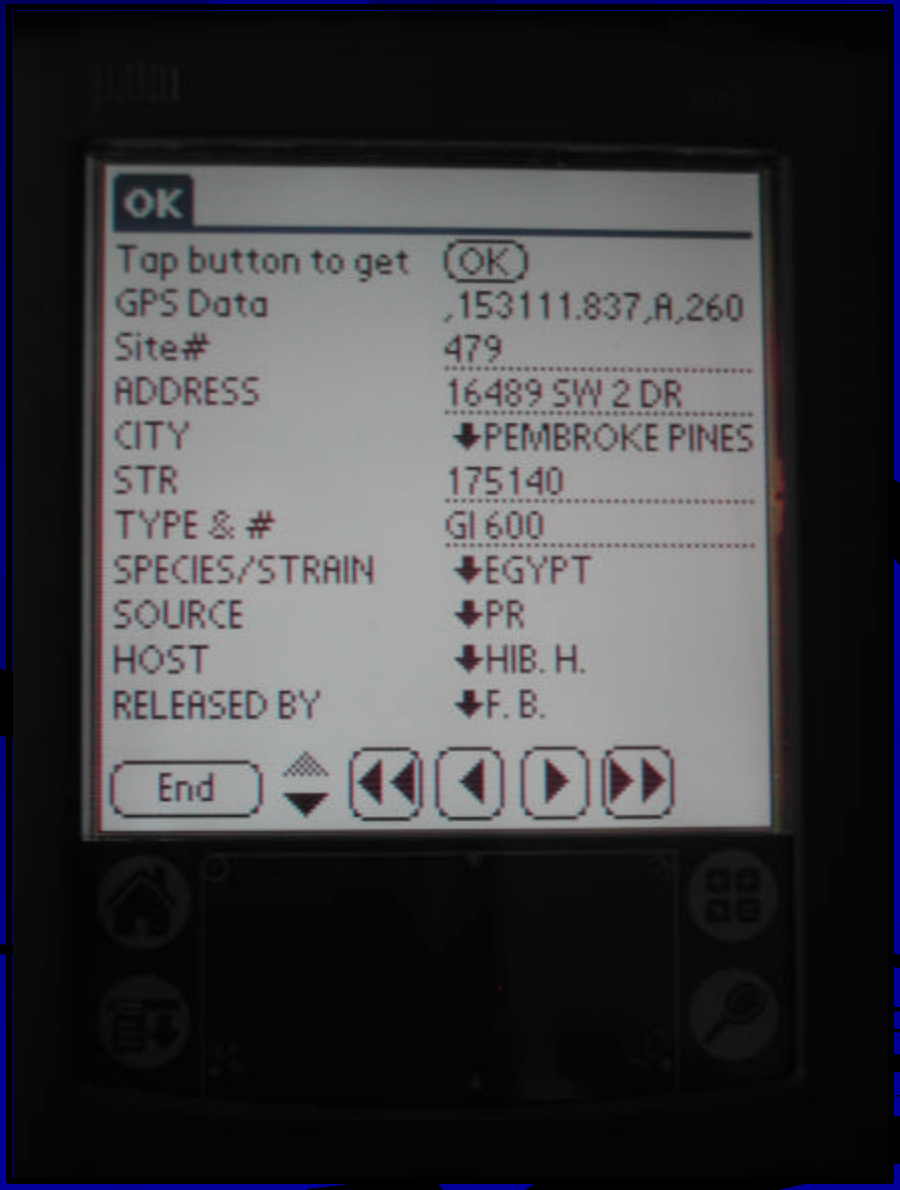
  (Refer to pages 5-5 to 5-7 of the USDA, APHIS, PPQ PHM Manual found at referenced website)
  http://www.aphis.usda.gov/ppq/manauls/pdf_files/phm.pdf

PHM Parasite Release Program

- Parasite release data should be captured utilizing a Personal Data Assistant (PDA) with Global Positioning System (GPS) capabilities.

- Captured data should include;
  - GPS coordinates
  - Site number
  - Address
  - STR or grid number
  - Type & number of parasites
  - Species / strain
  - Source
  - Host plant
  - Released by

Parasite Release Data Collection



Parasite Release Data Collection

RecordID	TimeStamp	GPSData	SiteNum	ADDRESS	CITY	STR	TYPENUM	SP	SOURCE	HOST	RELBY
0	########		149	15048	PEMBR	215140	AK 200	CHINA/H	PR	HIB. H.	F. B.
0	########		149	15048	PEMBR	215140	GI 200	AUSTRA	PR	HIB. H.	F. B.
0	########		285	846 E 30	HIALEA	85341	AK 400	CHINA/H	PR	HIB. S.	F. B.
0	########		285	846 E 30	HIALEA	85341	GI 400	AUSTRA	PR	HIB. S.	F. B.
0	########		287	4705 E 9	HIALEA	55341	AK 200	CHINA/H	PR	HIB. S.	F. B.
0	########		287	4705 E 9	HIALEA	55341	GI 200	AUSTRA	PR	HIB. S.	F. B.
0	########		380	4715 E 8	HIALEA	55341	AK 400	CHINA/H	PR	HIB. S.	F. B.
0	########		380	4715 E 8	HIALEA	55341	GI 400	AUSTRA	PR	HIB. S.	F. B.
0	########		379	4698 E 8	HIALEA	55341	AK 200	CHINA/H	PR	HIB. H.	F. B.
0	########		379	4698 E 8	HIALEA	55341	GI 200	AUSTRA	PR	HIB. H.	F. B.
0	########		300	781 E 47	HIALEA	55341	AK 400	CHINA/H	PR	HIB. S.	F. B.
0	########		300	781 E 47	HIALEA	55341	GI 400	AUSTRA	PR	HIB. S.	F. B.
0	########		382	541 E 47	HIALEA	55341	AK 400	CHINA/H	PR	HIB. H.	F. B.
0	########		382	541 E 47	HIALEA	55341	GI 400	AUSTRA	PR	HIB. H.	F. B.
0	########		299	530 E 45	HIALEA	55341	AK 200	TAIWAN	PR	HIB. S.	F. B.
0	########		299	530 E 45	HIALEA	55341	GI 200	EGYPT	PR	HIB. S.	F. B.
0	########		301	714 E 48	HIALEA	55341	AK 400	TAIWAN	PR	HIB. H.	F. B.
0	########		301	714 E 48	HIALEA	55341	GI 400	EGYPT	PR	HIB. H.	F. B.
0	########		303	460 E 52	HIALEA	325241	AK 200	TAIWAN	PR	HIB. S.	F. B.
0	########		303	460 E 52	HIALEA	325241	GI 200	EGYPT	PR	HIB. S.	F. B.
0	########		302	602 E 52	HIALEA	325241	AK 200	TAIWAN	PR	HIB. S.	F. B.
0	########		302	602 E 52	HIALEA	325241	GI 200	EGYPT	PR	HIB. S.	F. B.
0	########	,200143.	435	6084 E 7	HIALEA	325241	AK 400	TAIWAN	PR	HIB. S.	F. B.

Level of PHM Population Density Reduction by Parasitoids

Hibiscus

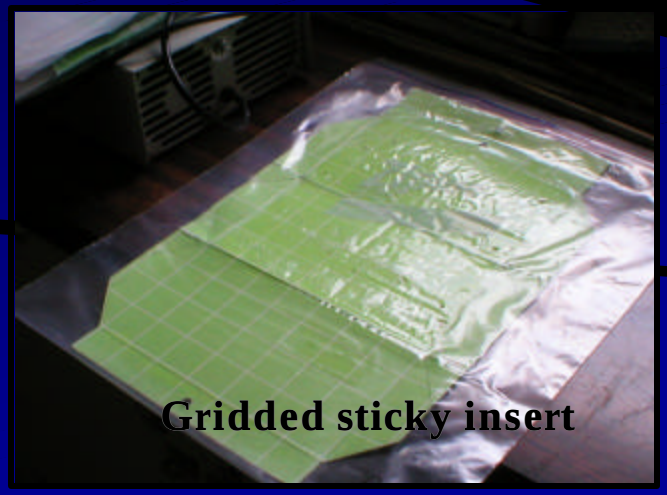
- St. Kitts = 91.6 %
- US Virgin Islands
  St. Thomas = 91.2%
  St. Croix = 97.1%
- Puerto Rico = 92%
- Culebra = 96.5%
- Vieques = 97.8%
- Belize = 96.6%
- California
  Mulberry = 96%
  Carob = 93%
- Bahamas = 82%
- Florida = 98.7%
- Haiti = 97.2%
- Dominican Republic = 96.6%

PHM Pheromone Traps

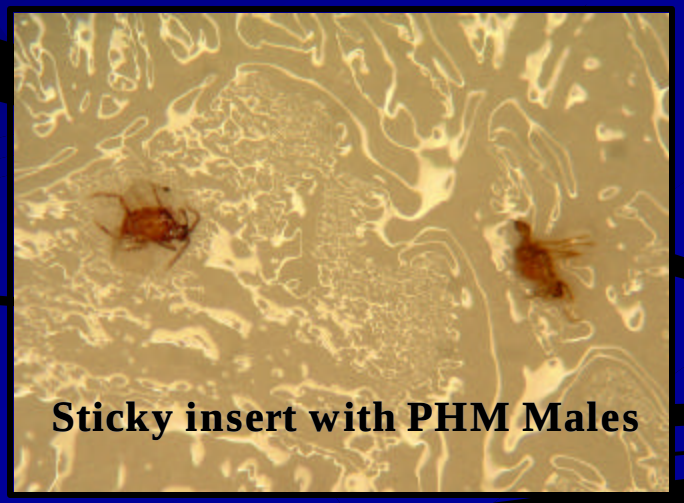
- Synthesized female sex pheromone available to detect males.
- Pilot project in Port St. Lucie, Florida.
  - Closest infestation >2 miles away
  - PHM trapped even though no visual signs
  - Indicates trap has high potential to detect PHM

PHM Pheromone Traps

- Delta traps recommended
  - Catch fewer non-target insects
- Trap Processing
  - Flattened and shipped in zip lock bag
  - Males removed for ID



Gridded sticky insert



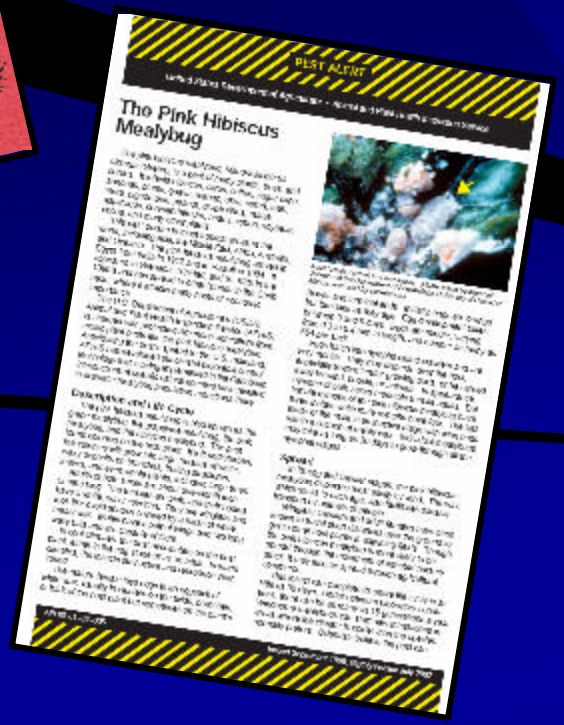
Sticky insert with PHM Males

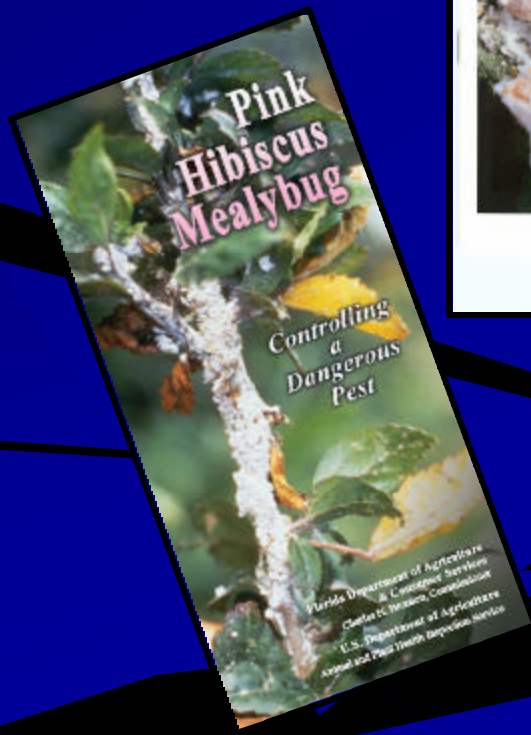
PHM Pheromone Traps: Use

- Presence / absence of mealybugs
  - Very effective at detecting that PHM is in the general area.
  - Serves as an additional survey mechanism when personnel resources are limited.

- Advantage of pinpointing infestations
  - More efficient use of limited number of parasitoids.
  - Targeted treatment (e.g., removal of infested material).

PHM Public Outreach Efforts





PHM Public Outreach Efforts

- Immediate establishment of a PHM helpline.
- The helpline serves as a central conduit for public queries relative to pest detection and identification.
- Calls are forwarded to appropriate area survey personnel for follow-up inspections.
- Program aids to serve as handouts. Handouts should briefly outline local or state survey and parasite release information.

PHM Public Outreach Efforts

- Nurseries
  - Program updates to industry organizations, general mail-out to entities within and around infested areas.
- Lawn – Landscape Companies
  - General mail-out to those companies operating in and surrounding PHM infested areas.
  - Utilize other survey personnel* to conduct outreach efforts in conjunction with current duties.
- Homeowners
  - General mail-out to homeowners in the core area.
  - Target local homeowner associations.
  - Door hangers at parasite release sites.
- Media and local extension service.
- PHM workshops conducted in high risk areas for growers, retail outlets, county and state officials and landscape maintenance companies.

PHM Web Sites

- **Pest Alert :** http://www.aphis.usda.gov/lpa/pubs/phmpaler.pdf
- **ID Card:** http://www.aphis.usda.gov/lpa/pubs/phmidcar.pdf
- **Pamphlet:** http://www.aphis.usda.gov/lpa/pubs/phmealyb.pdf
- **Manual:** http://www.aphis.usda.gov/ppq/manuals/pdf_files/phm.pdf
- http://www.bugwood.org/factsheets/mealybug.html
- http://mrec.ifas.ufl.edu/lso/PinkMealybug.htm

Contact Information

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